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SMUDGING AN ORCHARD WITH NATIVE MATERIAL IN ALABAMA

BY R. E. MALONE

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SMUDGING AN ORCHARD WITH NATIVE MATERIAL IN ALABAMA

Introduction

This bulletin is the result of work done by the writer while engaged as a member of The Tuskegee Institute Experiment Station at Tuskegee Alabama, in charge of the Fruit Growing Division.

Despite the warm climate of the southern portion of the United States, there is an annual danger of frost to the fruit growing industry, more especially as pertains to the growing of peaches. In the State of Alabama, there is a large amount of native material readily available, for the purpose of smudging, and repelling frost, if the value of these materials was only known.

The following pages contain a description of the native materials used in smudging, frost and the dew-point, the labor involved, the topography and location of the orchard, the soil, etc.

History of Smudging

Smudging, like many other beneficial agricultural practices did not have its origin in these modern days, but dates its beginning from the time of civilized man. It is said that Pliny recommended this practice as a positive annihilator of frost. Oliver de Serres, the great French agriculturest wrote that "Frost is repelled from the vine, if foreseeing it, you produce in various parts of your vineyard, thick smoke, by means of wet straw or half rotten manure." This man lived in the sixteenth century. According to Hegerlus, the practice of smudging was compulsory in one part of Germany during the end of the seventeenth century. A set of regulations was issued in the Baliwick of Phorzheim in 1796, which provided that the inhabitants of the communes should be divided into companies of twelve or eighteen men, under a chief, whose duty it was to give warning of the necessity for lighting the fires. These men were to operate in districts assigned them by an official inspector. One of the articles read that "Whosoever shall refuse to obey, shall be prosecuted before the bailiff and receive exemplary punishment."

It is said that during the Spanish civilization in Peru, smudging was carried on extensively. The Indians of this country carried on a similar practice according to Boussmgault.

Records show that the French people are more advanced in the art of smudging than any other people. This, of course, is to be

expected from the people whose agricultural workers now represent the richest land working individuals of the world.

These few facts show without a doubt that smudging is indeed a very old process, if not an ancient one. It is perfectly reasonable to assume that if within the sixteenth century the practice of smudging was being intelligently applied, at some date far previous to this the first experimenting and successful application of the same must have occurred. In the early days there appears to have been no one recognized system of smudging, simply a collecting of hetrogeneous material capable of giving off smoke. The European bundle of faggots is mentioned as frequently having been used.

The best systems now used in Europe are those of the French people. Some of the best systems are as follows: Lestout system, the Lagrolet system, the Audibert system and the Tanzin system. These systems are all alike in principle and have for their aim the securing of a dense, uniform resistant smoke.

In this country smudging is usually carried on by a system of smudge pots or pans. This is especially true of the northwestern section of the United States where smudging is carried on extensively. These pots are filled for the most part with oil, coal or coal tar products. Their success when properly handled is unquestioned.

Some attempts at smudging have been made in Florida and some of the other southern states, but fortunately that section of the country is not frequently disturbed by frosts or freezes. It must be understood here that there is difference between frost and a freeze.

A smudge for the repelling of a freeze has little or no value. The demand here, is for the elevation of the temperature which can best be done by heat.

DESCRIPTION OF THE PLANTATION

The orchard of the Experiment Station comprised some 100 acres, the major portion of which was devoted to the raising of peaches. There were 20,000 peach trees of which 5,346 were of bearing age.

The name and number of each variety were as follows:

Alexander	1107
Mayflower	740
Greensboro	212
Belle of Georgia	1001
Carman	2286
Total	5346

The Belle of Georgia belongs to the Chinese Cling group and, as will be hereafter shown, it was from this variety we secured the best results. All of these varieties were perfectly acclimated.

These 100 acres were situated, for the most part, on a high hill, with a south-western exposure in the center of the station farm.

Not more than five acres of the land were in a low place or valley. This station is situated in the southeastern part of the State.

The soil of the orchard comprised a sandy surface soil that could be quickly handled after a rain and would not bake when heated. The sub-soil was a gray clay and varied in depth from seven to fifteen inches below the surface soil.

Clean culture was followed during the growing season and the soil formed an excellent dust mulch when tilled. The orchard being situated on a hill was naturally well drained. Some of the hills were so steep that is was necessary to have hillside ditches about every forty feet to prevent the soil from washing. The ditches were self-cleaners.

Good roads permeated the entire orchard, in fact, it was skirted on three sides by the county roads. This expedited the hauling and smudging material.

THE PREDICTION OF FROST

No amount of smudging, unless properly done, at the proper time has any effect as to repelling frost and thus saving fruit. This point was distinctly made clear to the eighteen students who were regularly employed in the orchard and who assisted in the smudging operations.

Hoar frost, which injures plants, is frozen dew. The air condenses upon the plant forming dew. If the temperature falls below freezing point or 32 degrees, frost occurs. With this one point in mind we worked accordingly.

On cloudy nights we did not smudge, as frost does not occur with this atmospheric condition present.

On windy nights we did not smudge, as frost does not occur with this atmospheric condition present.

Our observation for the predicting of frosts was made with the Sling Psychrometer. It consists of two thermometers, the wet and dry bulb.

Our observation was made in the following manner:

The bulb of the wet bulb thermometer was thoroughly saturated in water. Both thermometers were then whirled rapidly for about twenty seconds and then read immediately. A note was made of the temperature and they were again whirled and read. The reading of the wet thermometer was substracted from that of the dry. This difference was found in the column at the side of the dew-point table. If this came above 32 degrees there was no danger of frost; if below then there was danger, unles there was wind or it was cloudy, etc.

If moisture was in the air the bulbs usually read alike. If the air was dry there was usually between 10 to 16 degrees difference in the reading of the thermometers.

We also found that after a dew had fallen, we seldom had a frost. The dew-point was determined by referring the thermometer reading to the table.

SMUDGING WITH NATIVE MATERIAL

The eighteen students were divided into two groups of nine each. The duty of one group was to tend the fires at night and the duty of the other group was to secure materials, the next day, for the fires of the ensuing night. These groups exchanged work every three days, so that each student could secure experience in the entire work.

During the early winter months considerable pruning had been done. One division of the orchard consisting of some 3000 old trees had been taken up entirely. The trunks and heavier limbs of these trees were secured as the basis of the Smudge pile.

Fortunately the wind usually blew from one direction, coming from the southwest. These piles were placed thirty feet apart, on the windward side until the whole area of 100 acres had been covered. A smaller portion of the orchard, consisting of some five acres, was on a hill different from the general slope of the main orchard. This hill, in other particulars, was the same as the main orchard. For experimental reasons no smudge piles were provided for this hill.

After the piles, with an equal amount of peach wood to each, had been laid, a number of barrels of tar were secured (roofing tar.) Five pails of tar were poured over the logs of each pile. A sawmill close by, owned by the school, furnished sawdust. Two barrels of sawdust were then poured over each of the piles. The neighboring woods were then scoured for pine foliage. We secured foliage from the yellow short leaf and lob-lolly pines. One fourth of a two-horse wagon load of the foliage was placed over each pile. Four pails of tar were then applied to each pile. Small splinters of resinous pine or fat wood (as it is called) were then placed by each pile. Every fifth pile a barrel of water was placed. This water was sprinkled upon each pile, at the rate of two pails to the pile about two hours before lighting. It was also there, in a case a pile suddenly bursting into a big blaze, could be readily dampened.

The basis of a smudge must be smoke, the object of which is to spread an artificial cloud over the plant and prevent the radiation of the earth's heat. This prevents a quick fall in the temperature.

The growth of fruit trees in the South usually ceases in August and the leaves begin to fall in September. As a rule, the trees are dormant until January or February, at which time spring growth commences.

Most damage to the trees is likely to be done during the season of

full bloom. This time usually begins about the middle of February and ends the latter part of March, or a period covering nearly two weeks. Active preparations for smudging should be made for this period.

A severe frost appeared during the night of January 16, 1911. For two weeks there were nightly frosts. The same quantity of smudging material was added daily as described above and we found that it was usually necessary to extinguish the fires the next morning. Not only was a slow smouldering fire kept, but it was an extremely warm one. The center of the smoked area frequently registered two and three degrees warmer than the outer portions.

Our experiments showed mainly the value of the lob-lolly pine as an evergreen shrub for smudging. We noted that the lob-lolly made a better and denser smoke than any of the other pines. We found that a pile composed of the lob-lolly pines burned on an average of from one hour to one hour and a half longer than the other evergreens.

The area of orchard that was not smudged had practically no peaches on any of the trees, while that area that was smudged produced more and better peaches than were ever produced before on this orchard. Peaches were shipped by the carload, to say nothing of supplying a community of some three thousand people.

The trees in the surrounding community for miles were without the semblance of fruit.

The ditch banks of the orchard were burned during the smudging process. As a result of this burning together with the spraying, only one plum curculio was found in the entire orchard.

While it cannot be said from this experiment that smudging forces early fruit, we have every reason to believe that it does.

We found that the varieties Alexander and Belle of Georgia were earlier than they have been before. In fact, we had an exhibit of these peaches on April 25, 1911.

CONCLUSION

The evergreen tree makes an excellent smudging material.
The lob-lolly pine is the best of the evergreen group for smudging
Sawdust is a valuable adjunct for the making of smoke.

THE PRACTICALITY OF SMUDGING

Smudging is a probable help for the forcing of early fruits.

Difference of reading of dry and wet bulbs	Temperature of air in degrees (Fah.)											
	15	20	25	30	35	40	45	50	55	60	65	70
1	11	16	22	27	32	38	43	48	53	58	63	69
2	6	12	18	25	30	35	41	46	52	57	62	67
3	7	14	21	27	33	39	44	50	55	60	66	
4	1	10	17	24	30	36	42	48	53	59	64	
5	4	13	20	27	33	40	46	51	57	62		
6	7	16	24	30	37	43	49	55	61			
7	1	11	20	27	34	41	43	53	59			
8	5	16	24	31	39	45	51	57				
9	11	20	28	36	43	49	55					
10	4	16	25	33	40	47	53					
11	11	21	30	38	45	51						
12	4	17	27	35	42	49						
13	11	23	32	40	47							
14	5	18	28	37	45							
15	12	24	34	42								

—L. H. BAILEY.

Dry Bulb Thermometer.....60 degrees
Wet Bulb Thermometer.....47 degrees
Difference .....13 degrees

Dew point from table.....32 degrees
Probably no frost